

University of Bahrain
College of Information Technology
Department of Computer Science
Semester 2, 2012-2013

ITCS312/ITCS314 (Formal languages and Automata Theory)

Test-I

Answer Sample

Date: April 1, 2013

Time: 3:00-4:00

STUDENT NAME
STUDENT ID #
SECTION	

NOTES:

- WRITE ONLY ONE SOLUTION FOR EACH QUESTION.
- SWITCH OFF YOUR MOBILE PHONES.
- THIS EXAM CONTAINS 4 PAGES.
- ANSWER ALL THE FOLLOWING QUESTIONS
- $\Sigma = \{a,b\}$ UNLESS STATED OTHERWISE

QUESTION #	MARKS		COMMENTS
1	5		
2	11		
3	14		
TOTAL	30		

Question One (True/ False) (5 marks)

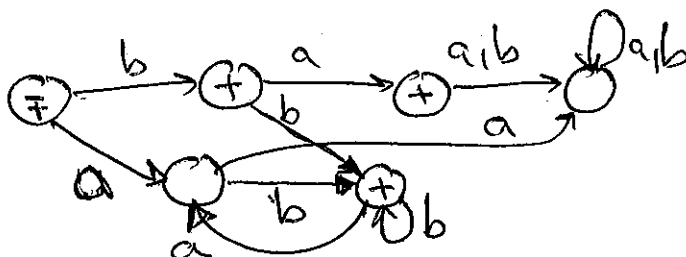
1. In NFA- Λ , Λ is among Σ (\times).
2. If R and Φ are regular expressions then $\Phi R = \Phi$. (\checkmark)
3. $(a^*b^*)^* = (a + b)^*$ (\checkmark)
4. $L_1 L_2 = L_1 + L_2$ if $L_2 = \{\Lambda\}$ and L_1 is not empty and does not accept Λ . (\times)
5. Moore machine has always one more node than that of Mealy machine. (\times)

Question Two (11 marks)

Complete the following

1. $(a^* + b^*)^* = (a+b)^*$ (Give another equivalent RE) (2 marks)

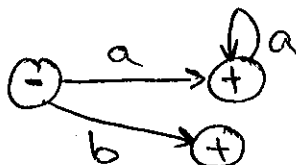
2. The FA for $(ab+ab)^* + ba$ (2.5 marks)



3. The RE for $L = \{ a \text{ abb abbbb abbbbb abbbbbbb } \dots \}$ (2 marks)

$$a(bb)^*$$

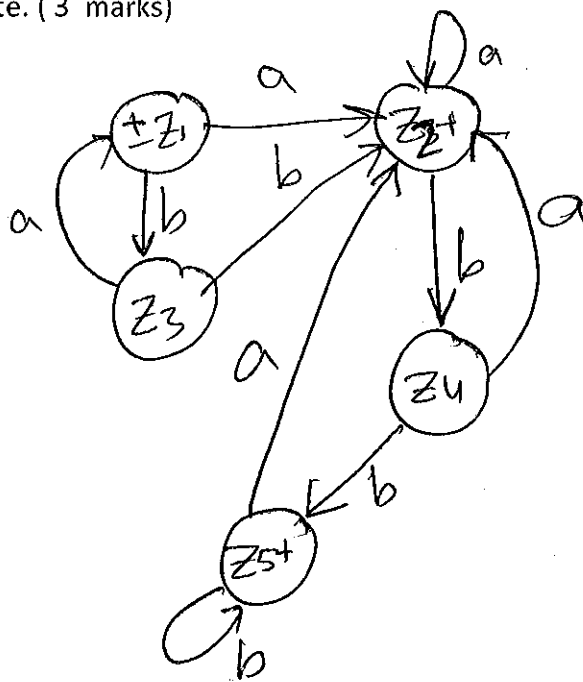
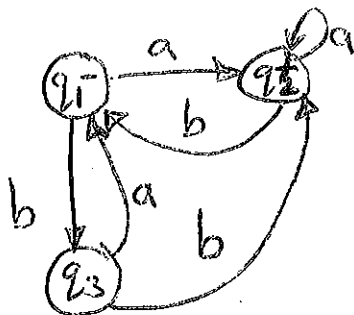
4. The NFA for $aa^* + b$ (2 marks)



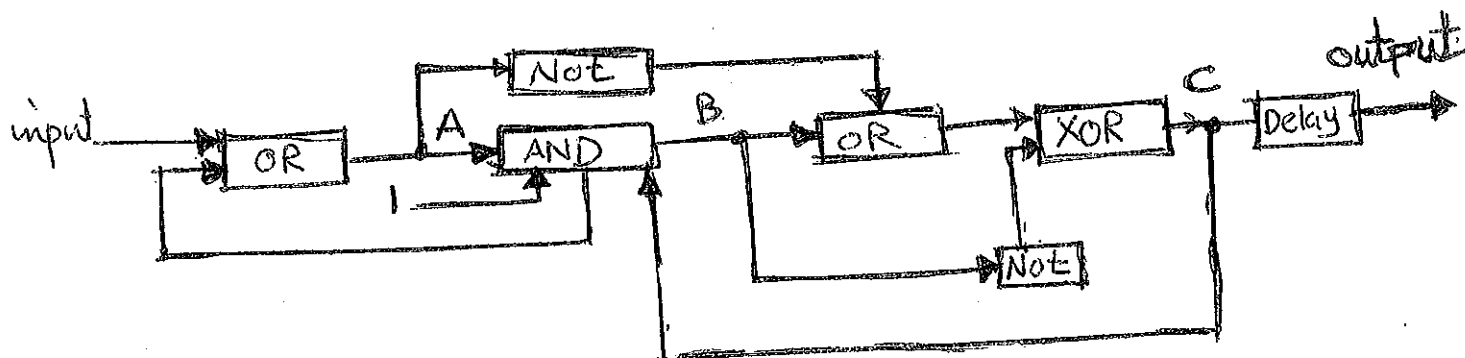
5. Mealy machine for a machine that counts number of a's where $\Sigma = \{a,b\}$ (2.5 marks)



4. Given the following FA, find the FA for R^* , where q_1 is a starting, q_2 is a final state and q_3 is not a final state. (3 marks)



5. Given the following sequential circuit, show the required formulas and states (initial) to get the corresponding Mealy machine (3 marks).



$$\text{new } A = \text{input OR (old } A \text{ AND old } C)$$

$$\text{new } B = (\text{old } A \text{ AND } 1 \text{ AND Old } C)$$

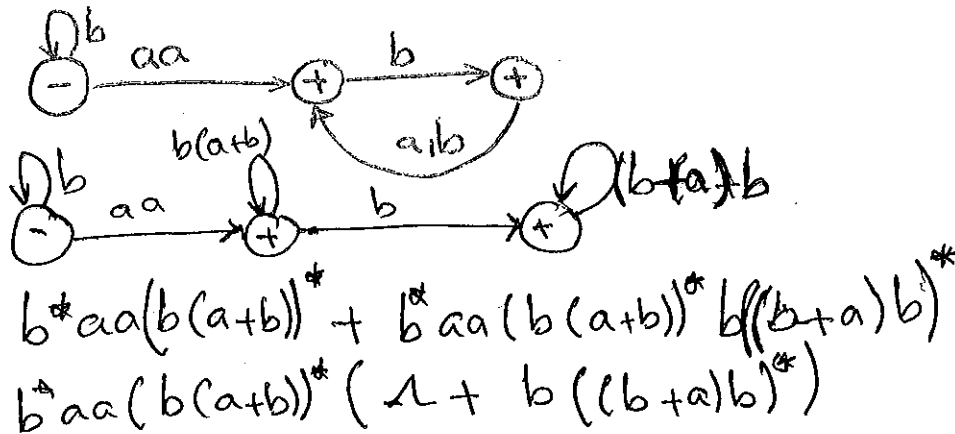
$$\text{new } C = ((\text{Not old } B) \text{ XOR } ((\text{old } B) \text{ OR Not old } A))$$

$$\text{output} = \text{old } C$$

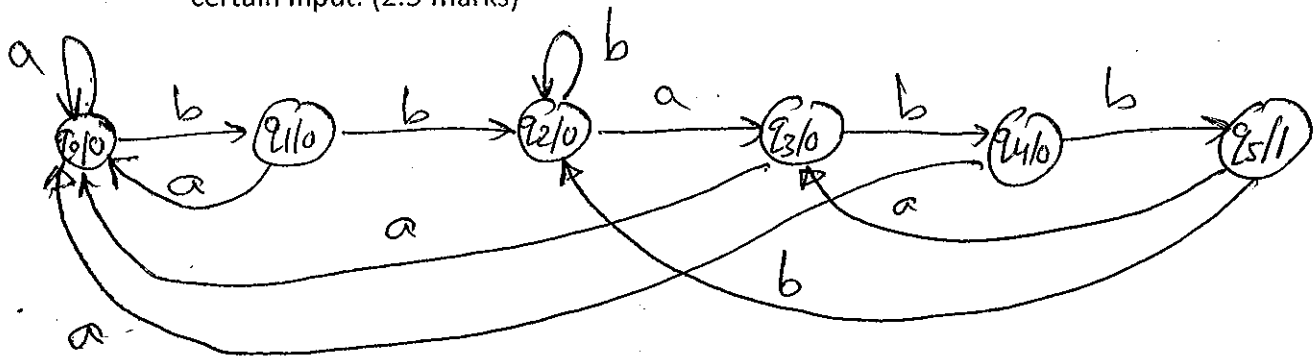
	A	B	C
q0	0	0	0
q1	0	0	1
q2	0	1	0
q3	0	1	0
q4	1	0	1
q5	1	0	1
q6	1	1	1
q7	1	1	1

Question Three (14 marks)

1. Given the following TG, find the corresponding RE (2.5 marks)



2. Give Moore machine that counts the occurrence of **bbabb** substring in a certain input. (2.5 marks)



3. Given the following Mealy machine, give the corresponding Moore machine. (3 marks)

